

Fieldwork

## Invasive Sea Squirts Persist on Georges Bank Fishing Grounds

By Page Valentine (USGS), Robert Reid (NOAA), and Jeremy Collie (URI)

During the last 2 weeks of August, scientists from the U.S. Geological Survey (USGS), the National Oceanic and Atmospheric Administration (NOAA), the University of Rhode Island (URI), and the Department of Fisheries and Oceans Canada spent 10 days on the Georges Bank fishing grounds documenting the occurrence and effects on gravel habitats of the invasive colonial sea squirt *Didemnum* sp. For the fourth consecutive year, researchers surveyed two areas on Georges Bank where the sea squirt continues to thrive. The colonies are denser than in 2005 over the 88-mi<sup>2</sup> area observed, but scientists found no colonies in nearby Canadian waters, indicating that they have not spread eastward.

As in previous years, scientists conducted the annual survey from the NOAA ship *Delaware II*, out of NOAA's Northeast Fisheries Science Center in Woods Hole, Mass. On the morning of departure (August 22), Senator **Barbara Mikulski** (D-MD) visited the center, where she inspected the *Delaware II* and received a briefing on cruise objectives from scientists who showed her the sampling and camera systems to be used on the cruise. In addition, she was shown living examples of the invasive sea squirt overgrowing blue mussels collected by **Dann Blackwood** and **Jennifer Bonin** (both of USGS) from dock pilings in Woods Hole.

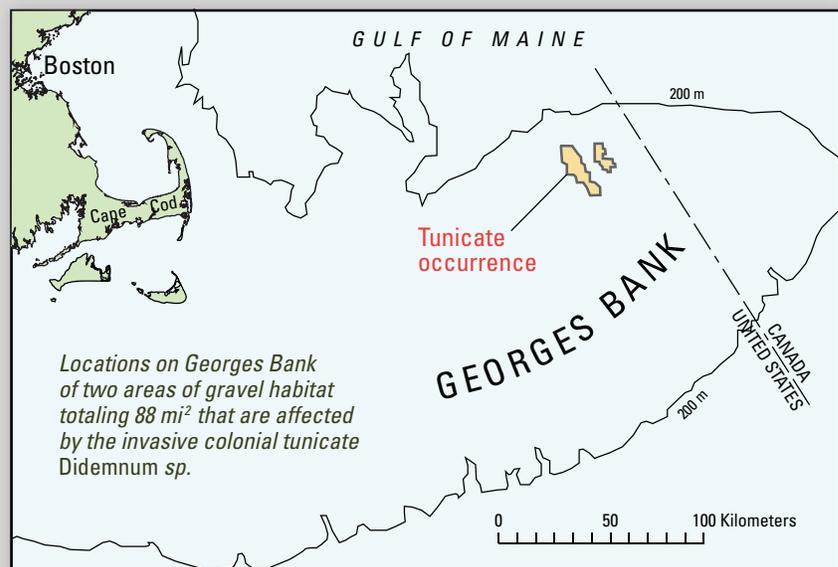
This year's survey included video transects as much as 0.8 mi long using the USGS Seabed Observation and Sampling System (SEABOSS; see URL <http://pubs.usgs.gov/fs/fs142-00/>). Preliminary evaluation of the images indicates that the gravel is 50 to 75 percent covered at some study sites, a marked increase over last year.

"On Georges Bank, the area of seabed covered by the colonies has doubled at 75

*(Sea Squirts continued on page 2)*



Top (left) and underside (right) of a tunicate colony of *Didemnum* sp. growing over and cementing a gravel seabed. Colony mat is shown hanging in air to demonstrate its toughness. View of underside (right) shows pebbles that once formed the seabed surface. Collected from northern Georges Bank (lat 41°58.841' N., long 67°19.533' W.) at 53-m (174 ft) water depth in August 2006 by **Page Valentine**, **Jeremy Collie**, and **Robert Reid**. Photographs by **Dann Blackwood**, USGS.



## Sound Waves

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## Submission Guidelines

**Deadline:** The deadline for news items and publication lists for the December 2006-January 2007 issue of *Sound Waves* is Friday, December 1.

**Publications:** When new publications or products are released, please notify the editor with a full reference and a bulleted summary or description.

**Images:** Please submit all images at publication size (column, 2-column, or page width). Resolution of 200 to 300 dpi (dots per inch) is best. Adobe Illustrator® files or EPS files work well with vector files (such as graphs or diagrams). TIFF and JPEG files work well with raster files (photographs or rasterized vector files).

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## U.S. Geological Survey Earth Science Information Sources:

Need to find natural-science data or information? Visit the USGS Frequently Asked Questions (FAQ's) at URL <http://www.usgs.gov/search/faq.html>

Can't find the answer to your question on the Web? Call 1-888-ASK-USGS

Want to e-mail your question to the USGS? Send it to this address: [ask@usgs.gov](mailto:ask@usgs.gov)

## Fieldwork, continued

(*Sea Squirts continued from page 1*)

percent of the sites we observed in both 2005 and 2006," said **Page Valentine** of the USGS Woods Hole Science Center, who tracks occurrences of the species off the Northeastern United States and elsewhere in the world. The greater density of colonies observed during the survey is evidence that the infestation is persistent and not a short-lived phenomenon.

**Robert Reid**, a biologist with NOAA Fisheries Service and chief scientist for the

survey, agreed that the sea squirt appears to be proliferating in the study area. "The fact that it is still there in high abundance over a fairly large area certainly indicates this occurrence is not ephemeral," **Reid** said.

Scientists remain concerned that the infestation could threaten important fisheries in the region. Sea-squirt mats could prevent fish from feeding on worms and crustaceans that live in and on the gravel bot-

(*Sea Squirts continued on page 3*)



Senator **Barbara Mikulski** (D-MD) visits the NOAA ship Delaware II before its departure for Georges Bank. Right to left, **Page Valentine** (USGS) briefs Senator **Mikulski**, **Paul Carliner** of the senator's staff, and LCDR **Richard Wingrove**, captain of the vessel. Photograph by **Jayne Doucette**, NOAA.



*Tunicate colony of **Didemnum** sp. growing over a colony of the white tubeworm **Filograna implexa**. Note the small openings at the ends of the tubes where the worms live. Width of specimen shown is approximately 2.5 cm (1 in.). Collected from northern Georges Bank (lat 41°58.841' N., long 67°19.533' W.) at 53-m (174 ft) water depth in August 2006 by **Page Valentine**, **Jeremy Collie**, and **Robert Reid**. Photograph by **Dann Blackwood**, USGS.*

## Fieldwork, continued

(Sea Squirts continued from page 2)

tom, reduce the shelter required for these species to avoid predators, and limit the space available for settlement of larvae of sea scallops and other species. *Didemnum* is a nuisance to the aquaculture industry, overgrowing shellfish in New England coastal waters.

Sea squirts are also called tunicates, having a primitive spinal cord and an outer sheath or “tunic,” from which the name derives. Tunicates spread in several ways: by larvae that swim for only a few hours before settling; by colonies that hitchhike onto such surfaces as boat hulls, moorings, fishing gear, and other manmade objects and are carried to new, favorable habitats; and by fragments of colonies that are broken up by human activities and natural events and drift until they settle elsewhere. They expand outward by budding new, millimeter-size individuals to form circular mats, as much as 1 ft in diameter. The mats coalesce with neighboring colonies to form a tough, barren layer of intergrown colonies that attach to hard surfaces, including gravel, wood, metal, and plastic. No other species is known to eat or overgrow them.

Scientists first observed the *Didemnum* colonies in 2003, on the U.S. side of the international maritime boundary separating U.S. and Canadian waters of Georges Bank. The bank is frequently fished by commercial vessels, particularly sea scallopers and ground fishermen. The same or similar species of *Didemnum* occur on the coasts of Europe, New England, California, Washington, British Columbia, and New Zealand. So far, this is the only occurrence reported in an offshore fishing ground.

**Jeremy Collie**, a URI biologist, has been studying benthic communities in the Georges Bank area since before the sea squirts arrived, and he is monitoring the effects the tunicates are having on the benthos. “We haven’t seen any dramatic changes yet, but as the percentage of the area covered by the tunicate gets higher and higher, it’s going to seal off the sea floor. That’s when we expect to see significant effects,” he said.

**Dawn Sephton**, a biologist from the Department of Fisheries and Oceans Canada, Maritimes Region, was also part of the



*Decorator crab with colonies of the tunicate *Didemnum* sp. growing on its carapace. Collected from northern Georges Bank (lat 41°57.221' N., long 67°30.899' W.) at 47-m (154 ft) water depth in August 2006 by Jeremy Collie, Page Valentine, and Robert Reid. Photograph by Dann Blackwood, USGS.*

scientific team this year because the study included Canadian waters. **Sephton** currently leads a project to detect and monitor invasive tunicate species along the Bay of Fundy and Nova Scotia coastlines. “While the absence of *Didemnum* at the Canadian study sites is welcome news, we are con-

cerned about its potential spread and impact on fisheries and shellfish aquaculture in the Maritimes,” **Sephton** said.

For high-resolution images and more information on *Didemnum* worldwide, visit URL <http://woodhole.er.usgs.gov/project-pages/stellwagen/didemnum/>. ❁



Crew members of the NOAA ship Delaware II in August 2006 deploying the USGS SEABOSS, a system for imaging and sampling the seabed that has video and still cameras and a grab for collecting sediment and benthic fauna. Photograph by **Dann Blackwood**, USGS.

## North to Alaska—an Aerial Shoreline Reconnaissance

By Ann Gibbs and Bruce Richmond

**Bruce Richmond** and **Ann Gibbs** flew hundreds of kilometers along Alaska’s Arctic Ocean coast in August 2006, collecting reconnaissance aerial imagery of the North Slope coastline and barrier islands. The fieldwork was part of the U.S. Geological Survey (USGS)’s National Assessment of Shoreline Change project, a response to chronic beach erosion along U.S. open-ocean shorelines.

The weather cooperated well enough for 3 days (August 7-9) of flying, covering approximately 800 km of coastline from the United States-Canadian border to approximately 60 km southwest of Barrow, including both the mainland and barrier-island shorelines. Data were collected from a Cessna 185 Skywagon II floatplane piloted by **Jim Webster** out of Fairbanks, Alaska. Although some gaps exist because of fog banks and rain, the scientists estimate their total coverage at well over 80 percent. They collected more than 2,500 digital photos and nearly 10 hours of continuous high-definition video imagery of the coast. Using global-positioning-system (GPS) information and Red Hen Systems hardware and software, all the imagery was georeferenced to the aircraft position (approx 1,000 ft offshore and 500 ft above the ground) and

Alaska’s North Slope, from the United States-Canadian border to the Barrow Peninsula. Yellow dots show locations of photographs.

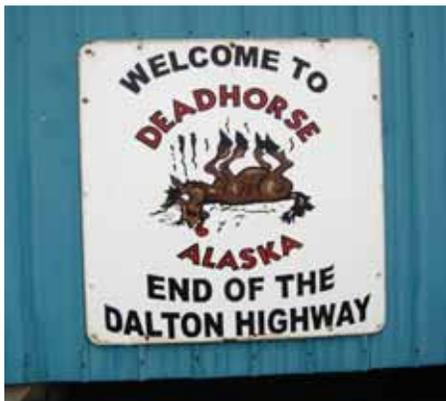


integrated into a geographic-information-system (GIS) database.

The photographs can be viewed by using a Google Earth file created by **Clint Steele**, in which the location of each photograph is plotted on a Google Earth basemap as a dot that is also a link to low- and high-resolution versions of the photograph. To download the file, visit URL <http://walrus.wr.usgs.gov/infobank/a/a106ak/html/a-1-06-ak.meta.html>, go to the “Google Earth” row near the top of the page, and click on “Download photos.”

The field operation was based out of Deadhorse, Alaska, a small town at the end of the Dalton Highway, near Prudhoe Bay and the start of the Trans-Alaska oil pipeline. The town has only a handful of permanent residents (although at any one time there may be 5,000 or more workers in the area) and consists mainly of facilities for the workers and companies that operate at the nearby Prudhoe Bay oil fields. Facilities in Deadhorse are built entirely on manmade gravel pads and most commonly consist of prefabricated trailers brought up by truck, barge, or plane. Highlights include the airport, the general store, and two inns that provide all-you-can-eat buffets twice a day. Because of hazardous working conditions in the Arctic, Deadhorse is a dry (alcohol free) town.

The tidal range along the North Slope coast is small, typically less than 1 ft. The coastal landforms include low-lying, unvegetated sand and gravel barrier islands; tundra bluffs that are 1 to 10 m high and fronted discontinuously by narrow sand and gravel beaches; and broad shallow bays and deltas. Several studies examining



One of the many caribou that wander through the town of Deadhorse.



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## Fieldwork, continued

(North to Alaska continued from page 4)

historical shoreline change along segments of the Alaskan Arctic Ocean coast have all documented extremely high rates of shoreline retreat—as much as 16 m/yr—with some indication that retreat rates may be accelerating. There is a clear need for a regional study of historical shoreline positions along this coast.

The National Assessment of Shoreline Change project was initiated by the USGS Coastal and Marine Geology Program to provide an analysis of historical shoreline changes along open-ocean sandy shores of the conterminous United States and parts of Alaska and Hawaii (see URL <http://coastal.er.usgs.gov/shoreline-change/>). A primary goal of this work is to develop standardized methods for mapping and analyzing shoreline movement so that internally consistent updates can periodically be made to record shoreline erosion and accretion. To date, the project has completed analyses for the Gulf of Mexico, the southeast Atlantic coast, and California, with continuing efforts in Hawaii, Oregon, and Washington. USGS colleagues in Alaska encouraged Coastal and Marine Geology Program scientists to begin studies in Alaska, with an initial focus on the North Slope area. The recent fieldwork was part of a new task of the project focusing on the Alaska coastline between the United States-Canadian border and Barrow. ❄️



*Tundra slump blocks with no beach present.*



*Tundra bluffs with narrow beach.*



*Low-lying patterned-ground tundra fronted by a narrow beach. The brown areas are inundated tundra that has been flooded by seawater.*



*One of the offshore barrier islands, showing a well-defined erosional scarp and gravel mounds "plowed" onto the beach face by sea ice. The scarp is about 1 m high.*



*Ann Gibbs (right) ready to board the floatplane*

## California and the World Ocean Conference—Addressing Growing Demands on Ocean Resources

By Helen Gibbons

The State of California recently hosted “California and the World Ocean ‘06” (CWO ‘06), an international conference focused on improving ocean and coastal management in California and throughout the world. Held September 18-20 in Long Beach, CWO ‘06 drew 1,000 attendees from 23 States and 6 countries spanning 4 continents. Among the participants were U.S. Geological Survey (USGS) Coastal and Marine Geology Program Director **John Haines**, USGS Western Coastal and Marine Geology Team Chief Scientist **Sam Johnson**, and numerous additional USGS personnel who gave talks, presented posters, and hosted a large booth in the exhibit hall.

Growing demands on the ocean make such meetings more important than ever, as noted on the conference Web site (URL <http://resources.ca.gov/ocean/cwo06/invitation.htm>): “By 2025, 75 percent of California’s population is projected to live in coastal counties. These population trends are similar to those occurring throughout the United States and in other coastal locations throughout the world.

Our growing population is bringing about additional pressures on resources that will require new and innovative approaches for management. This conference will help us take the next steps.”

The meeting opened on Monday, September 18, with the announcement of a tri-State agreement between California, Oregon, and Washington to develop coordinated action on regional ocean and coastal management. California Governor **Arnold Schwarzenegger** was at the podium, and Governors **Ted Kulongoski** (Oregon) and **Chris Gregoire** (Washington) participated via satellite from Portland, Ore., as they announced their West Coast Governors’ Agreement on Ocean Health.

Also announced that day was a new USGS report on coastal change along California’s more than 450 mi of sandy shoreline. Among the findings in “National Assessment of Shoreline, Change Part 3: Historical Shoreline Change and Associated Coastal Land Loss Along Sandy Shorelines of the California Coast” (USGS Open-File Report 2006-1219, URL <http://pubs.usgs.gov/of/2006/1219/>) is that

66 percent of California’s beaches have been eroding over the past several decades. Both the tri-State agreement and the new USGS report were described in an article in the San Diego *Union Tribune* (URL <http://www.signonsandiego.com/news/nation/20060919-9999-1n19marine.html>)

The first and second authors of the new USGS report, **Cheryl Hapke** and **Dave Reid**, gave talks at the conference on “Long-Term Coastal Cliff Retreat in California” (**Hapke**) and “Regional Shoreline Change Trends Along California’s Beaches” (**Reid**). Other USGS presenters gave talks on “USGS Geologic and Habitat Mapping and GIS” (**Guy Cochrane**), “Huntington Beach 1:24,000-Scale Coastal Mapping: Integrating Bathymetry, Topography, and Geology” (**Pete Dartnell**), and “Storm Timing and Dispersal of Fine Sediment into the California Coastal Ocean” (**Jon Warrick** and **Katie Farnsworth**). At a poster session on Monday evening, **Homa Lee** presented “Sediment and Contaminant Transport in the California Urban Ocean,” **Tom Lorenson** presented an “Overview of Natural Oil

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*Mike and Laura Torresan talk to conference attendees visiting the USGS booth at California and the World Ocean '06.*

## Meetings, continued

(World Ocean continued from page 6)

Seepage in the Santa Barbara Channel and Southern Santa Maria Basin, Southern California,” and **Jon Warrick** presented “River Plume Properties and Dynamics Offshore Southern California.”

In the exhibit hall, open all day Monday and Tuesday and also during the Monday evening poster session, more than two dozen booths offered information about companies, nonprofit organizations, and government agencies. A large USGS booth—staffed by **Helen Gibbons, Laura Torresan, Mike Torresan**, and volunteer

**Mario Torresan**—attracted numerous visitors with striking views of the sea floor in posters and computer flythroughs. Once drawn to the booth, visitors were offered a wealth of handouts and information about USGS coastal and marine research.

The conference covered a wide range of topics, such as mapping beach and coastal-bluff erosion, reducing the impacts of energy production and industry, sustaining beaches through sediment management, monitoring bacteria in recreational water, desalinating ocean water, improving

ocean awareness through education and the media, decommissioning oil platforms, mapping the sea floor, adopting an ecosystem-based approach to managing ocean resources, and much more. In addition to scientific experts, participants at the conference included experts in policy, planning, and government, making it a particularly rich setting for the exchange of ideas and information. This was the fourth California and the World Ocean conference; previous meetings were held in 1964, 1997, and 2002. ❁

## Awards

### Debbie Norling Honored with Excellence Award

By Susan Horton

U.S. Geological Survey (USGS) employee **Deborah Norling** was chosen to receive the 2006 Women of Excellence Award in the Public Service category given by the Lafayette (Louisiana) Commission on the Needs of Women. **Debbie** was selected for the honor because of her accomplishments in the community, excellence in performance, leadership through motivating others, and role in opening doors for other women in the community.

**Debbie**, who serves as secretary for both the Wetlands Ecology and Forest Ecology Branches at the USGS National Wetlands Research Center (NWRC) in Lafayette, is a catalyst for volunteer service among her coworkers. She has coordinated regular blood drives, the Salvation Army-sponsored Angel Tree (holiday gifts for needy children), contributions to the UNICEF Tsunami Relief Fund, and Hurricane Katrina and Rita relief efforts. In the wake of Hurricane Katrina, **Debbie** worked at a local evacuee shelter, sorted clothes, assisted with paperwork, provided childcare, gathered donations for the evacuees, organized supplies for those conducting search and rescue in New Orleans, and scheduled NWRC staff

members for work shifts at a temporary shelter in the Cajundome.

Beyond the local level, **Debbie** serves on the USGS Central Region Special Emphasis Program Advisory Committee and is the Central Region’s liaison for the Federal Women’s Program. For Women’s History Month in March 2006, **Debbie** developed a program for the local Federal community around the theme “Women: Builders of Communities and Dreams.” She coordinated a talk to the group by U.S. Senator **Mary Landrieu** (D-LA) and invited women mayors and writers from several surrounding communities.

**Debbie** received her award at the Women of Excellence Awards Luncheon held September 29 in Lafayette. These words that **Debbie** has posted by her desk at NWRC are a testament to her long-standing commitment to service:

To laugh often and love much; to win the respect of intelligent persons. . . to give of one’s self. . . to know even one life has breathed easier because you have lived—this is to have succeeded. (Bessie A. Stanley, *Heart Throbs*, 1911)

She lives these words every day. ❁



**Debbie Norling**, winner of the 2006 Women of Excellence Award in the Public Service Category.

## New Member of Marine Facility Staff on West Coast

By Jon Childs and Helen Gibbons

The U.S. Geological Survey (USGS) Western Coastal and Marine Geology Team is pleased to welcome **Jamie Grover**, who has joined the Marine Facility (Marfac) staff as a mechanical technician and small-boat captain. **Jamie** has extensive experience with small-boat and diving programs, most recently with the Partnership for Interdisciplinary Study of Coastal Oceans (PISCO) at the University of California, Santa Cruz (UCSC), where he was responsible for vessels and dive operations, nearshore oceanographic-instrumentation moorings, annual subtidal biological surveys, and assorted other marine-ecology projects. **Jamie** has a 100-ton U.S. Coast Guard Master's license and will be responsible for the operations of the USGS research vessel *Karluk* (currently berthed in Seattle) and the new survey vessel the team is planning to acquire.

**Jamie** grew up in "a family of actors" in New York City, where his experiences included acting in a daytime soap opera and assorted TV commercials. His father was an actor in Broadway musicals as well as in movies and TV, and his mother is a writer. Like **Jamie**, his old-



Publicity photo from the early 1970s, when **Jamie** was playing Clay Stevens on CBS's "The Secret Storm."



er brother and sister did stints as child actors. "At one point," he said, "we were all acting in soap operas, and my mom was writing them." He attended high school in California, lived for several years in Key West, Fla., and then returned to the West Coast to attend UCSC, where he earned a bachelor's degree in marine biology.

In addition to his experience in research, **Jamie** has seen work as a commercial fisherman and diver, charter-boat operator, and salvage operator. He has worked many years in Puget Sound, central California, Prince William Sound, the Florida Keys, and the Baja Pacific coast. We are very fortunate to have someone of his experience on the team. Over the next few weeks, **Jamie** will be helping with the relocation of Marfac from Redwood City to Santa Cruz, after which he will be stationed in Santa Cruz. When you're in the neighborhood, look for him and say hello. ☼



**Jamie Grover** aboard UCSC's research vessel *Paragon* on Monterey Bay in 2005, servicing popup acoustic-recorder arrays for a joint project with UCSC's Center for Integrated Marine Technologies (CIMT) program (URL <http://cimt.ucsc.edu/>) and Cornell University (URL <http://www.birds.cornell.edu/brp/ARUMarine.html>). The acoustic recorders are whale-listening devices used to triangulate movement over large areas.

## Publications

### Recently Published Articles

Ackerman, S.D., Butman, B., Barnhardt, W.A., Danforth, W.W., and Crocker, J.M., High-resolution geologic mapping of the inner continental shelf; Boston Harbor and approaches, Massachusetts: U.S. Geological Survey Open-File Report 2006-1008, DVD-ROM [URL <http://woodshole.er.usgs.gov/pubs/of2006-1008/>].

Albrecht, T., Horak, D., Kreisinger, J., Weidinger, K., Klvana, P., and Michot, T.C., 2006, Factors determining pochard nest predation along a wetland gradient: *Journal of Wildlife Management*, v. 70, no. 3, p. 784-791.

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*(Recently Published continued on page 9)*

(Recently Published continued from page 8)

- Geochimica et Cosmochimica Acta, v. 70, no. 15, p. 3996-4006, doi: 10.1016/j.gca.2006.05.015.
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- Lidz, B.H., 2006, Pleistocene corals of the Florida Keys; architects of imposing reefs—why?: *Journal of Coastal Research*, v. 22, no. 4, p. 750-759 [URL <http://www.jcronline.org/perlserv/?request=get-abstract&doi=10.2112%2F06-0634.1>].
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- Poppe, L.J., Ackerman, S.D., Doran, E.F., Moser, M.S., Stewart, H.F., Forfinski, N.A., Gardner, U.L., and Keene, J.A., Geologic interpretation and multibeam bathymetry of the sea floor in southeastern Long Island Sound: U.S. Geological Survey Open-File Report 2006-1059, DVD-ROM [URL <http://pubs.usgs.gov/of/2006/1059/>].
- Thieler, E.R., and Ashton, A.D., Late Quaternary evolution of the Carolina Capes; evidence for an early Holocene transition from five capes to four [abs.]: *Geological Society of America Abstracts with Programs*, v. 38, no. 7, p. 375 [URL [http://gsa.confex.com/gsa/2006AM/finalprogram/abstract\\_112732.htm](http://gsa.confex.com/gsa/2006AM/finalprogram/abstract_112732.htm)].
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## Publications Submitted for Director's Approval

- Barnhardt, W.A., Baldwin, W.D., Denny, J.F., Schwab, W.C., Gayes, P.T., Driscoll, N., and Voulgaris, G., Integrating high-resolution mapping of the seafloor with sediment-transport measurements to understand coastal erosion in northern South Carolina [abs.]: American Geophysical Union Fall Meeting, San Francisco, Calif., December 11-15, 2006.
- Bratton, J.F., The importance of shallow confining units to submarine groundwater flow [abs.]: International Union of Geodesy and Geophysics (IUGG) General Assembly, 24th, Perugia, Italy, July 2-13, 2007.
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